FINAL
FIELD SAMPLING PLAN FOR
GUN AND MORTAR POSITIONS

OF THE
CAMP EDWARDS IMPACT AREA
GROUNDWATER QUALITY STUDY

MASSACHUSETTS MILITARY RESERVATION
CAPE COD, MASSACHUSETTS

Prepared for

NATIONAL GUARD BUREAU
ARLINGTON, VIRGINIA

Prepared by

OGDEN ENVIRONMENTAL AND ENERGY SERVICES
239 Littleton Road, Suite 1B
Westford, Massachusetts 01886

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Final FSP Gun and Mortar Positions

DISCLAIMER:

This document has been prepared pursuant to a government administrative order (U.S. EPA Region I SDWA Docket No. I-97-1019) and is subject to approval by the U.S. Environmental Protection Agency. The opinions, findings, and conclusions expressed are those of the authors and not necessarily those of the Environmental Protection Agency.

A.13 Gun and Mortar Positions Field Sampling Plan

A.13.1 Background and Focal Areas

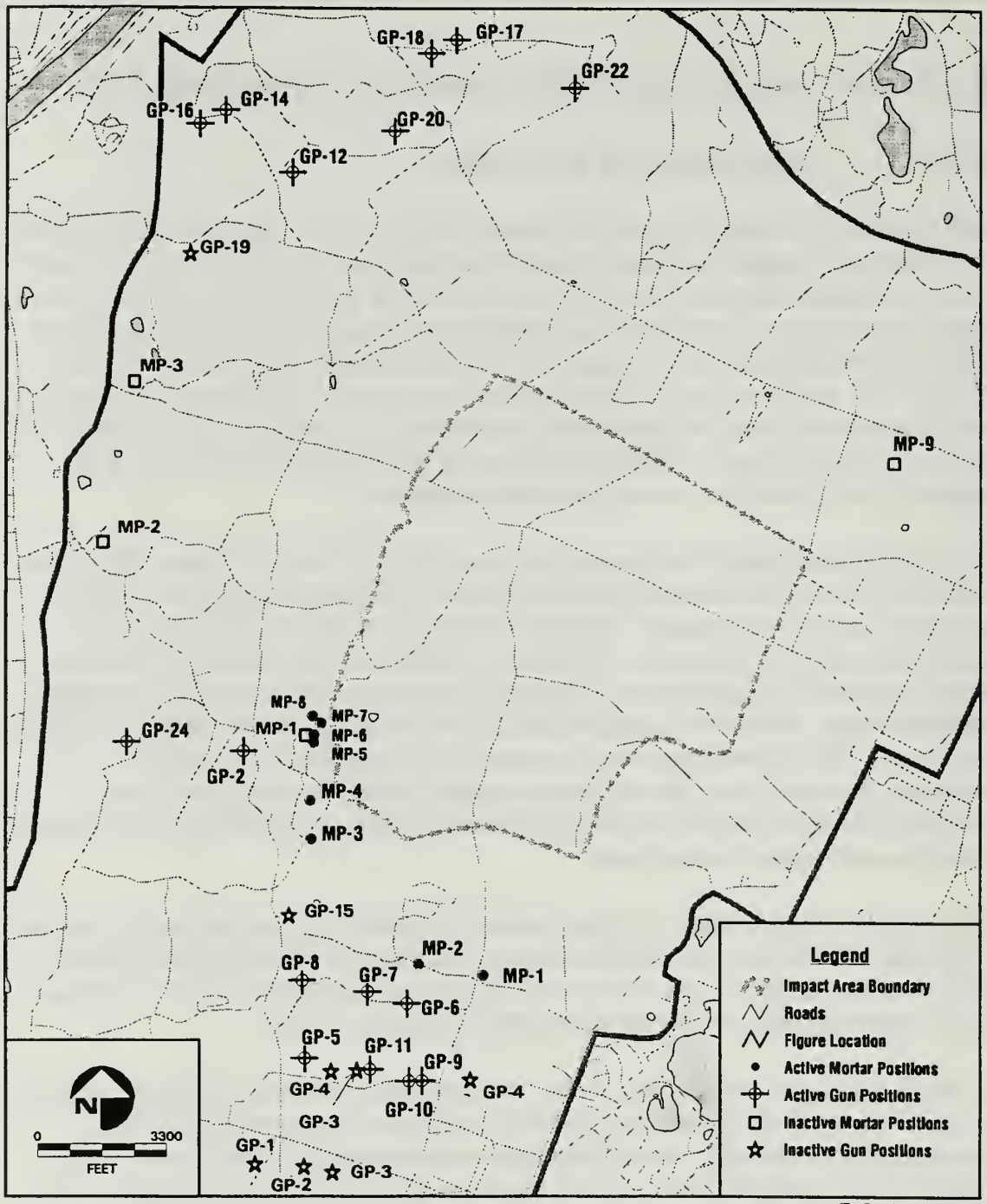
Active and inactive firing positions are shown in Figure A.13-0. As documented in Table B-1 of the Draft Range Use History Report, there have been 12 separate locations used as mortar positions in the past. Four of these locations (MP-9, and former MP-1, -2, and -3) are no longer active. A total of 24 locations have been used as gun positions in the past. Eight of these locations (GP-1, former GP-2, GP-3 and former GP-3, GP-4 and former GP-4, GP-15, and GP-19) are no longer active. Information regarding dates of operation and historic activities at these positions is summarized in Tables E-1 and E-2 of the Draft Range Use History Report. Generally the types of weapons fired are known, but the amounts of munitions fired at each location are unknown.

Most of the rounds used at the gun positions were 105 or 155mm howitzers. Part of the operations involved in firing howitzers and mortars is placing an appropriate number of propellant bags into the weapon. The number of bags used affects the distance the projectile travels. The munitions are shipped with the maximum number of bags needed to fire the shells their full distance. If the target is a shorter distance than the weapon's maximum range, there are extra bags of propellant remaining when the shipment of shells is exhausted. These extra bags would commonly be burned on the ground behind the position or in a ditch along the road at the position. Information from interviews indicates that unused ammunition was sometimes buried near a position if it could not be turned in to the Ammo Supply Point.

Currently there is no evidence of where burning occurred at the gun and mortar positions. According to Range Control there have been no burning activities since approximately 1989. It is also difficult to tell where weapons were set up and fired within the gun and mortar positions because the areas are smoothed over after each use.

A representative group of gun and mortar positions have been chosen for sampling based on the frequency of use during recent years for which data were available. Firing frequency and the amounts of propellant bags burned at each position are provided in Table A.13-1. Based on these data, four mortar positions and three gun positions were selected as representative of low use, medium use, and high use firing, based on discussions with EPA and MADEP. The low use positions are GP-18 and MP-5, the medium use positions are GP-7 and MP-6, and the high use positions are GP-16, MP-8,

Final FSP Gun and Mortar Positions



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MMR - Mortar and Gun Positions Vicinity Map

FIGURE

A.13-0

02/06/98

Table A.13-1. Gun and Mortar Position Utilization

	Average Rounds Fired[1]		Average Propellant Burned[2]	
	Number Rounds	Rank	% of Total	Rank
Active Mortar Positions				
MP1	564	5	13.4	3
MP2	428	7	10	5
MP3	633	4	24.9	High = 1
MP4	1417	2	16.5	2
MP5	211	Low = 8	2.9	
MP6	522	6	11.5	4
MP7	746	3	9.4	7
MP8	1935	High = 1	9.7	6
MP9			0	
IBC			0.5	Low = 10
T Range			1	9
Active Gun Positions				
GP2	0		0	
GP5	0		0	
GP6	171	5	14.3	High = 1
GP7	128	7	12	3
GP8	147	6	6.4	9
GP9	265	3	9.6	4
GP10	84	9	8.3	6
GP11	53	11	5.7	10
GP12	197	4	2.1	12
GP14	274	2	8.9	5
GP16	303	High = 1	7.4	8
GP17	4	13	1.8	13
GP18	14	Low = 12	3.2	11
GP20	60	10	11.2	2
GP22	99	8	8.2	7
GP24	0		0.8	Low = 14

[1] Rounds Fired Data from Draft Range Use History Report (July 1997) for 1989 and from additional training records for 1995 and 1996.

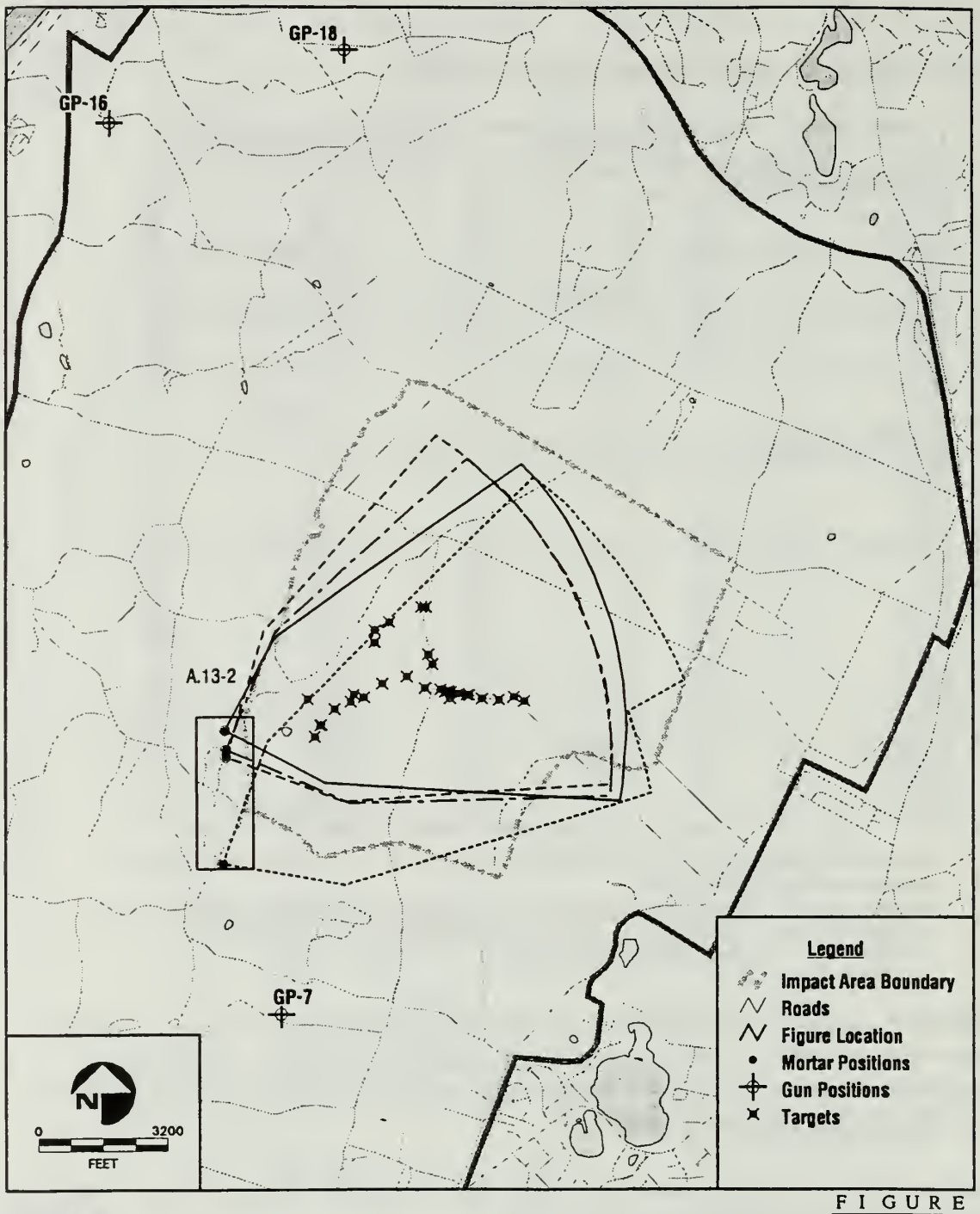
[2] Propellant Burned Data from "Risk Assessment No. 39-EJ-6995-97", U.S. Army CHPPM, July 1997, for 1986 and 1989-91 for gun positions, and for 1986 and 1989-1994 for mortar positions.

Shaded = Position selected for sampling

and MP-3. Locations of these positions are provided in Figure A.13-1 along with the targets for all positions, and the safety fans for the mortar positions. In addition, sampling will be required at GP-9, which was previously evaluated as CS-18 under the IRP, during a future phase of work.

Each position consists of a cleared area where the weapons are set up and fired. The sizes of these areas are summarized in Table A.13-2.

Final FSP Gun and Mortar Positions



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MMR - Mortar and Gun Positions Vicinity Map

FIGURE

A.13-1

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Table A.13-2. Sizes of Gun and Mortar Positions

Location	Dimensions (feet)	Area (acres)
GP16	250 x 250	1.4
GP7	400 x 150	1.4
GP18	220 x 200	1
MP8	150 x 50	0.2
MP6	210 x 85	0.4
MP5	115 x 190	0.5
MP3	240 x 120	0.7

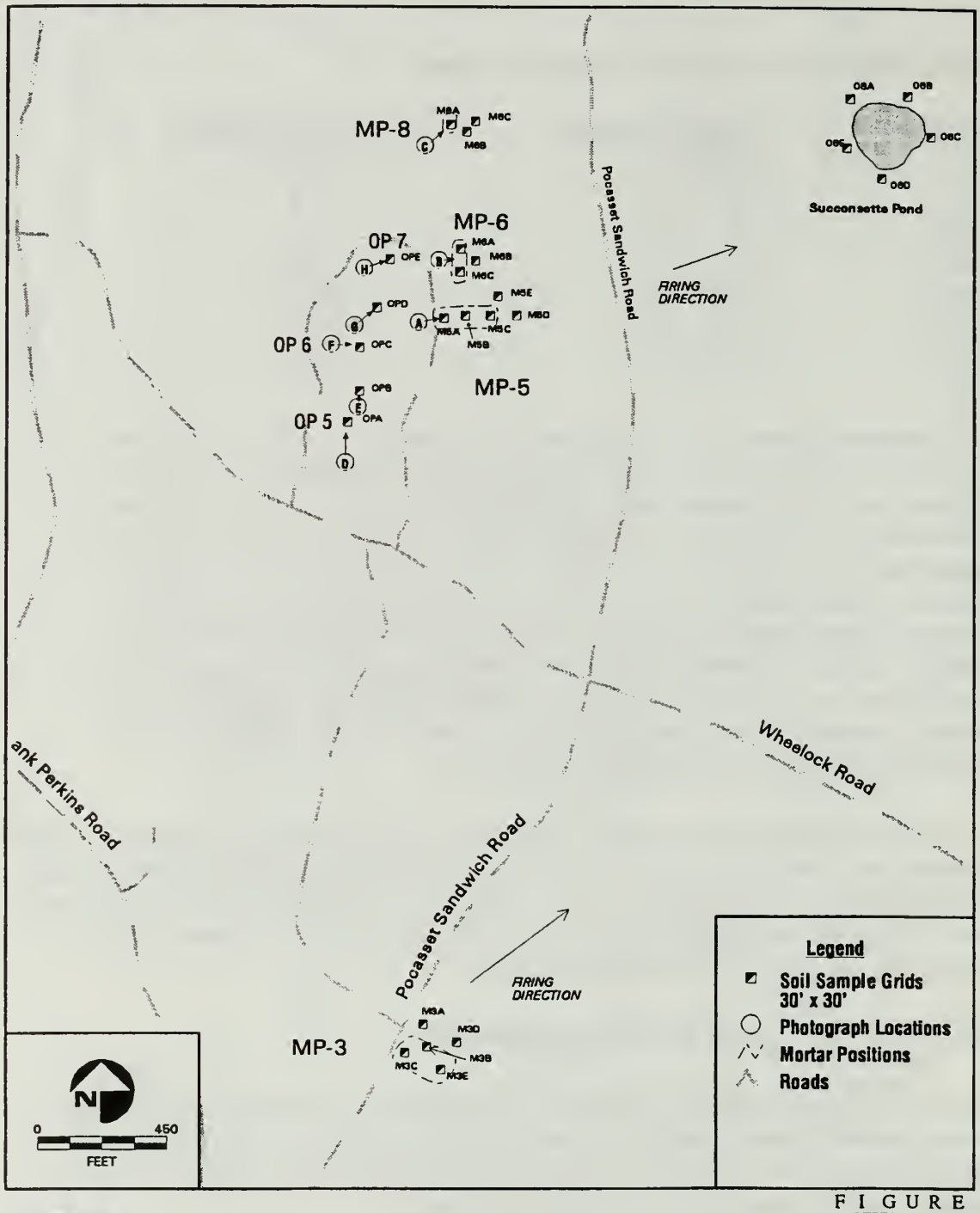
A representative portion of each focal area will be sampled, as indicated in Figures A.13-2, A.13-3, A.13-4, and A.13-5. Each of the gun and mortar positions is considered a focal area and will be sampled with evenly distributed 30' x 30' grids at a frequency of approximately 5 grids per acre. At least one grid will be near the access road where burning may have occurred at each position. GP-7 (Figure A.13-3) has a strip of vegetation approximately 50 feet wide which separates it from its access road. The access road grids at this position are located along the edge of the position, which parallels the road. Additional grids will be placed along the outside of each position along the edge of the position which faces the target and along the eastern edge of the position, to sample the area where deposition of airborne contaminants may occur (prevailing winds are predominantly from the west).

Observation points OP5, OP6, and OP7 will be used as control areas for sampling. These points are on a ridge west of and overlooking two of the mortar positions, MP5 and MP6, and have not been used for firing activities. One grid will be located at each observation point (OPA, OPC, and OPE) and two grids (OPB and OPD) will be placed along the ridge in the area between the observation points.

A.13.2 Sampling & Analysis Methods

The gun and mortar positions sampling will include surface soil at each focal area based on the potential release of munitions-related contaminants at ground surface from firing and burning activities. All surface soil samples will be collected in areas that have not been disturbed by excavation or road building activities.

Final FSP Gun and Mortar Positions



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MMR - Mortar Positions

FIGURE

A.13-2

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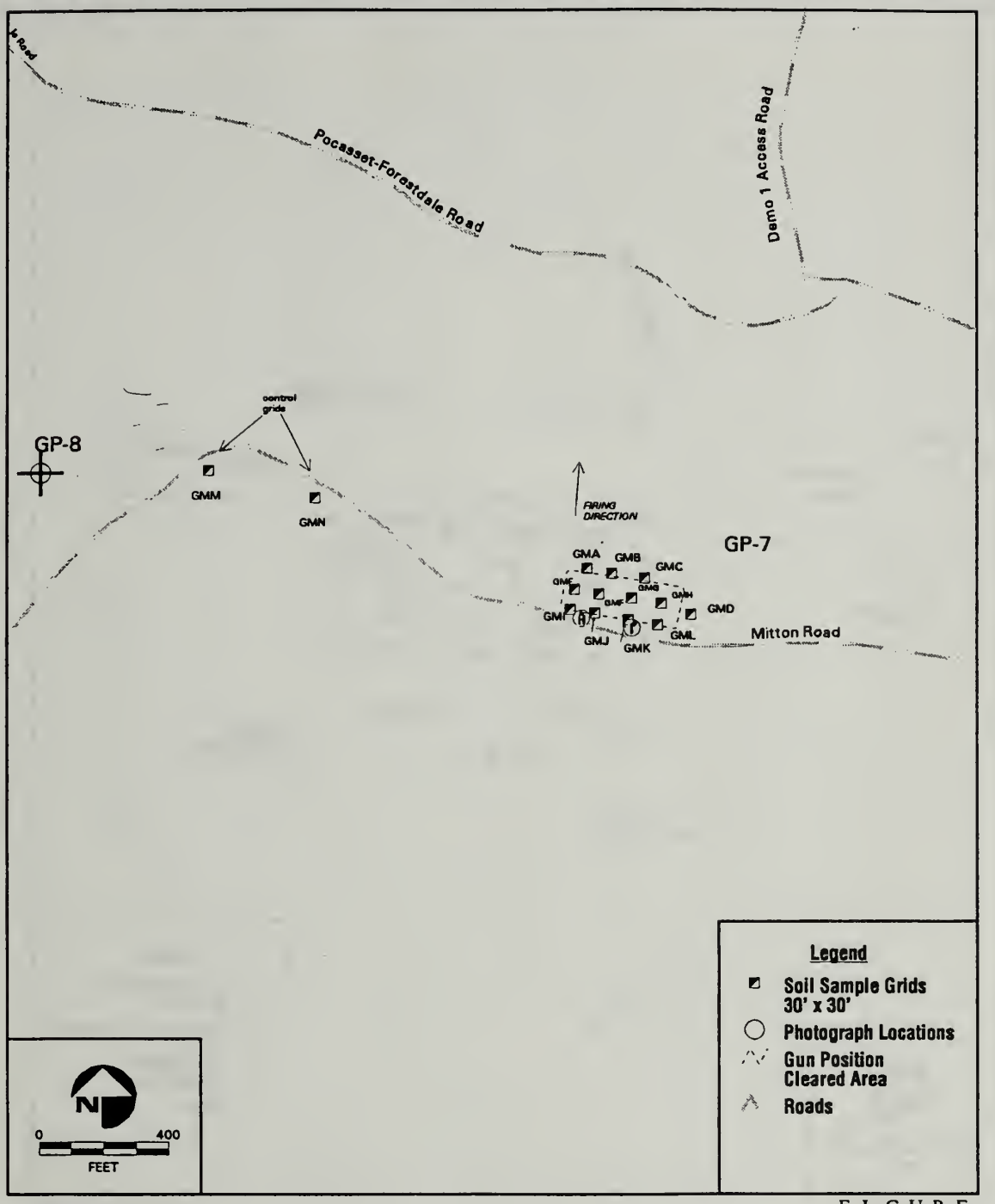
Final FSP Gun and Mortar Positions



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MMR - Gun Position 7

FIGURE A.13-3

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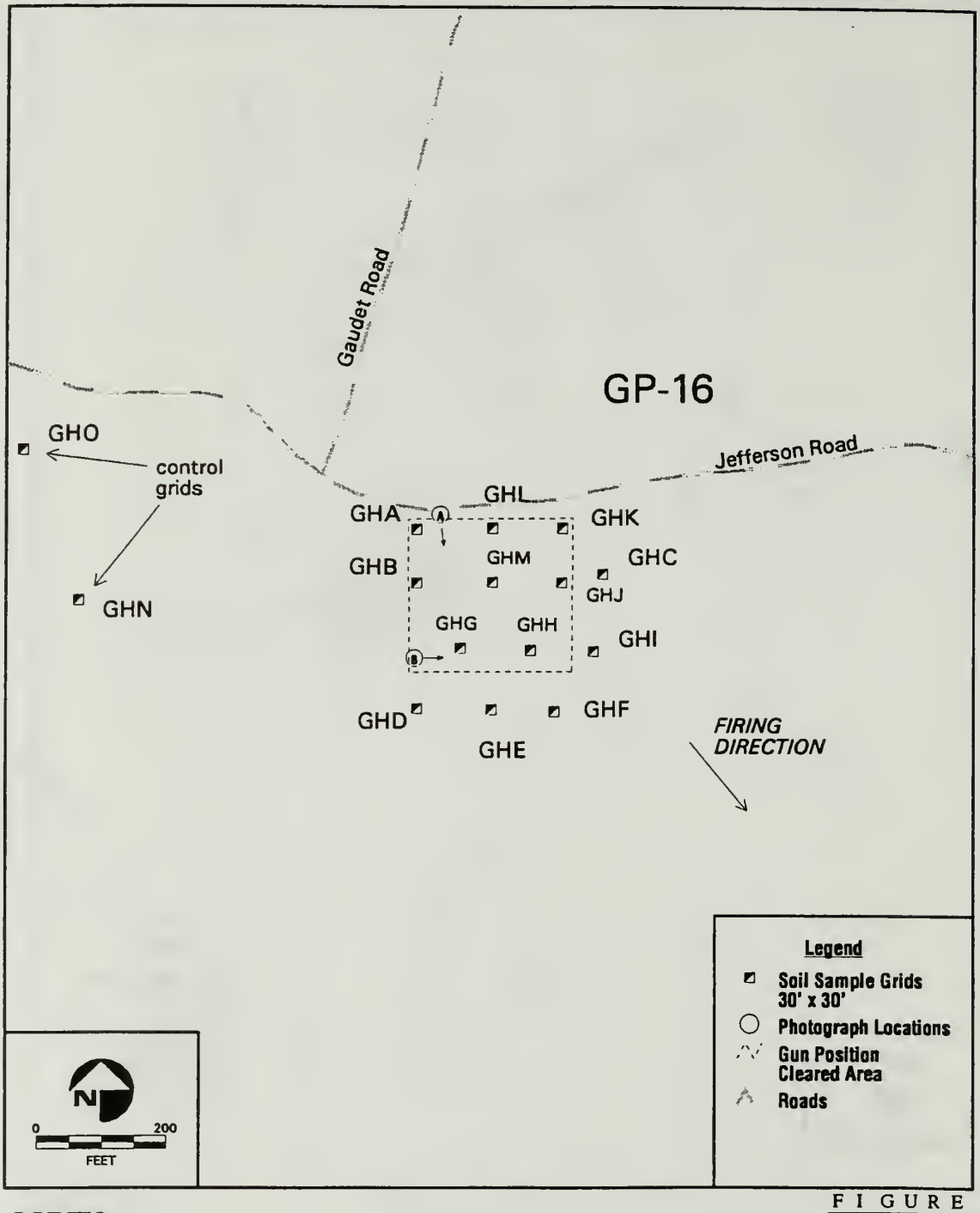
Final FSP Gun and Mortar Positions



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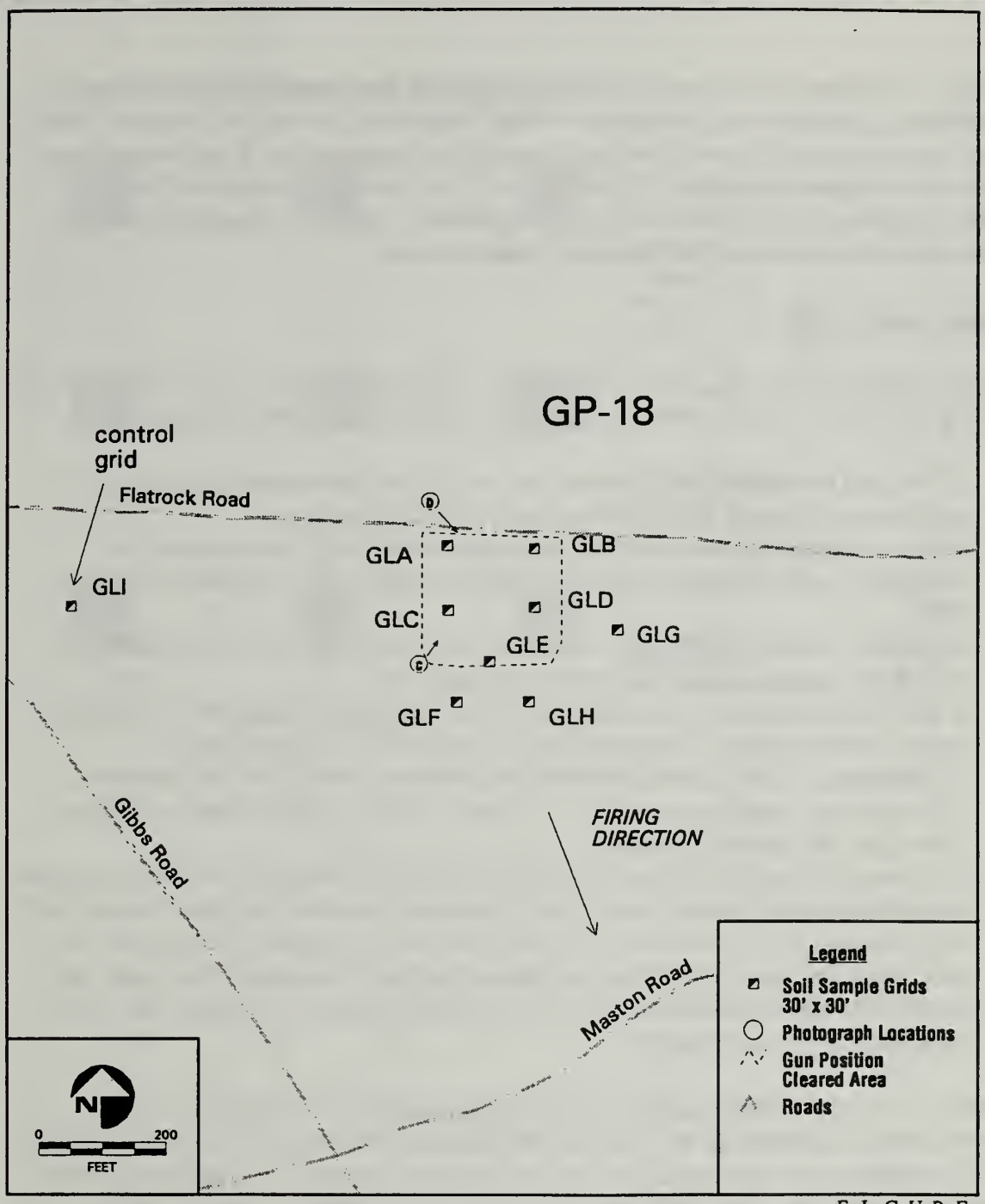
MMR - Gun Position 16

FIGURE A.13-4

Final FSP Gun and Mortar Positions



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MMR - Gun Position 18

FIGURE A.13-5

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Sample collection will be consistent with MMR SOPs, the Ogden Health and Safety Guidelines, Attachment A: Field guide to High Explosives, and the EPA Standard Guide for Composite Sampling and Field Subsampling for Environmental Waste Management Activities (October 31, 1996). EPA Method 8330 will be used to analyze all samples with detectable levels of explosives by the colorimetric analysis. **All mortar and gun positions are subject to UXO clearance requirements.**

Hand Auger Grids

Each soil boring grid will consist of nine sample points spaced ten feet apart as illustrated in Figure A.13-6. The following protocol will be followed for hand augering:

1. A 0-6" soil sample will be collected from each of the nine sample points in a grid;
2. soil from each sample point will be placed in a headspace jar;
3. the remaining soil from each of the nine sample points will be composited in accordance with Section 8.1 of the EPA Standard Guide and Attachment A of this FSP;
4. headspace measurements will be collected from each of the nine 0-6" samples and recorded in the space provided on the hand auger log;
5. a VOC grab sample will be collected from one sample point based on the following priority of observations: 1)highest response on the FID, 2) visual signs of contamination, 3) the central grid location (a fresh soil sample will be collected adjacent to the sample point). The VOC sample will be collected from within one foot of the FID screening sample;
6. the composite sample will be submitted for explosives, inorganics, and other analytes;
7. when the analytical results from the 0-6" sample are available, an 18-24" sample will be collected and composited as described above for explosives and inorganics. Any other analytes (except VOC) that are detected in the 0-6" sample will be analyzed;
8. an 18-24" sample will be selected for VOC analysis based on screening with an FID as described in steps 1-5 above.

Table A.13-3 lists sample numbers and analytical requirements for the areas to be investigated. In addition to the field samples identified in Table A.13-3, QA/QC samples will be collected as described in the Final Action Plan, Appendix A, Quality Assurance/ Quality Control Plan (July 1997), and the QA/QC Plan Addendum (August 1997). Detection limits for all analyses are described in the QA/QC Plan and the Addendum.

Figure A.13-6: Plan of Soil Sampling Grid:

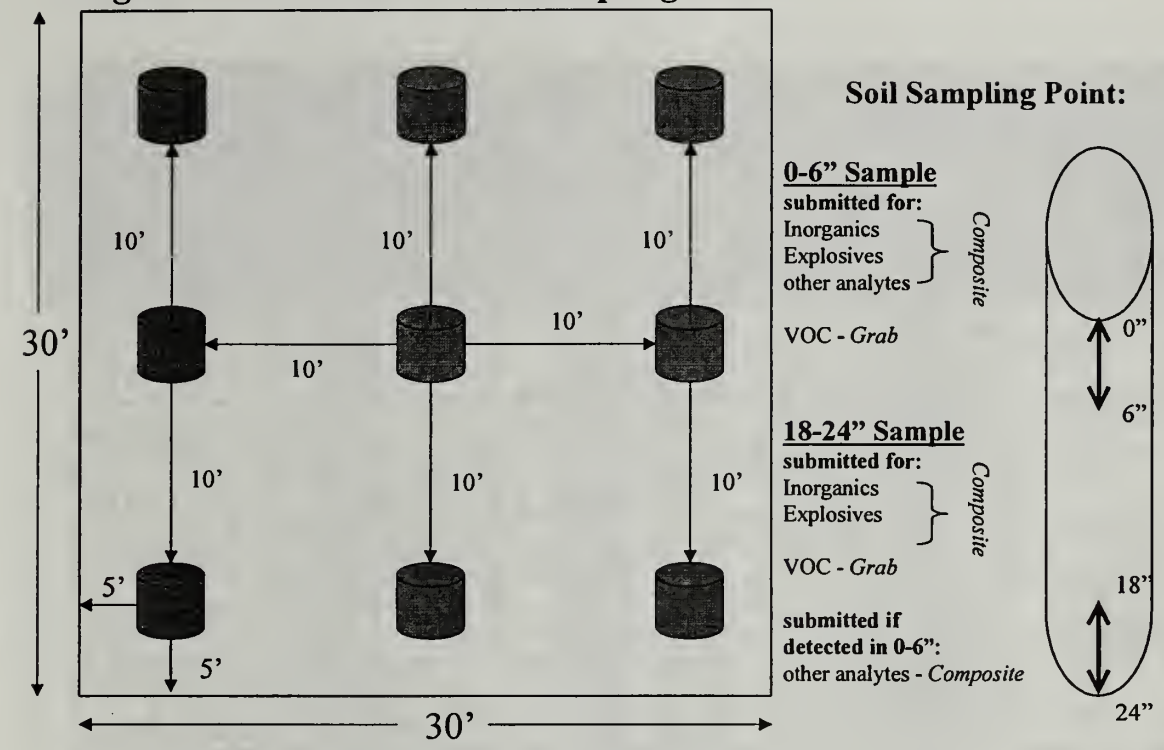

Table A.13-3 Samples to be collected from Gun and Mortar Positions

MMR Soil Samples from Hand Auger Grids						Parameters:	Explosives (colorimetric)	Explosives (EPA 8330)	Inorganics	Target Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
Area	Grid	Depth	Type	MMR ID	EPA/Ogden ID	Cont:	8oz	8oz	8oz		4 oz.	8 oz.			4 oz.*	
18 (GP18)	GLA	0-6	grab	71BSGLAXAX01XA	BGLAAA						X					
			comp	71BSGLAXAX01XA	BGLAAA		X		X			X	X	X	X	X
		18-24	grab	71BSGLAXBX01XA	BGLABA						#					
			comp	71BSGLAXBX01XA	BGLABA		O		O			#	#	#	#	#
	GLB	0-6	grab	71BSGLBXAX01XA	BGLBAA						X					
			comp	71BSGLBXAX01XA	BGLBAA		X		X			X	X	X	X	X
		18-24	grab	71BSGLBXBX01XA	BGLBBA						#					
			comp	71BSGLBXBX01XA	BGLBBA		O		O			#	#	#	#	#
	GLC	0-6	grab	71BSGLCXAX01XA	BGLCAA						X					
			comp	71BSGLCXAX01XA	BGLCAA		X		X			X	X	X	X	X
		18-24	grab	71BSGLCXBX01XA	BGLCBA						#					
			comp	71BSGLCXBX01XA	BGLCBA		O		O			#	#	#	#	#
	GLD	0-6	grab	71BSGLDXAX01XA	BGLDAA						X					
			comp	71BSGLDXAX01XA	BGLDAA		X		X			X	X	X	X	X
		18-24	grab	71BSGLDXBX01XA	BGLDBA						#					
			comp	71BSGLDXBX01XA	BGLDBA		O		O			#	#	#	#	#
	GLE	0-6	grab	71BSGLEXAX01XA	BGLEAA						X					
			comp	71BSGLEXAX01XA	BGLEAA		X		X			X	X	X	X	X
		18-24	grab	71BSGLEXBX01XA	BGLEBA						#					
			comp	71BSGLEXBX01XA	BGLEBA		O		O			#	#	#	#	#
	GLF	0-6	grab	71BSGLFXAX01XA	BGLFAA						X					
			comp	71BSGLFXAX01XA	BGLFAA		X		X			X	X	X	X	X
		18-24	grab	71BSGLFXBX01XA	BGLFBA						#					
			comp	71BSGLFXBX01XA	BGLFBA		O		O			#	#	#	#	#
	GLG	0-6	grab	71BSGLGXAX01XA	BGLGAA						X					
			comp	71BSGLGXAX01XA	BGLGAA		X		X			X	X	X	X	X
		18-24	grab	71BSGLGXBX01XA	BGLGBA						#					
			comp	71BSGLGXBX01XA	BGLGBA		O		O			#	#	#	#	#
	GLH	0-6	grab	71BSGLHXAX01XA	BGLHAA						X					
			comp	71BSGLHXAX01XA	BGLHAA		X		X			X	X	X	X	X
		18-24	grab	71BSGLHXBX01XA	BGLHBA						#					
			comp	71BSGLHXBX01XA	BGLHBA		O		O			#	#	#	#	#

X = to be collected and submitted to laboratory

O = to be collected and submitted when the results from the 0-6" sample are received

= to be collected and submitted only if detected in the 0-6" sample

Table A.13-3, continued

MMR Soil Samples from Hand Auger Grids						Parameters:	Explosives (colorimetric)	Explosives (EPA 8330)	Inorganics	Target Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
Area	Grid	Depth	Type	MMR ID	EPA/Ogden ID	Cont:	8oz	8oz	8oz		4 oz.	8 oz.			4 oz.*	
18 (GP18) cont.	GLI	0-6	grab	71BSGLIXAX01XA	BGLIAA						X					
			comp	71BSGLIXAX01XA	BGLIAA		X		X			X	X	X	X	X
		18-24	grab	71BSGLIXBX01XA	BGLIBA						#					
			comp	71BSGLIXBX01XA	BGLIBA		O		O			#	#	#	#	#
17 (GP7)	GMA	0-6	grab	71BSGMAXAX01XA	BGMAAA						X					
			comp	71BSGMAXAX01XA	BGMAAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMAXBX01XA	BGMABA						#					
			comp	71BSGMAXBX01XA	BGMABA		O		O			#	#	#	#	#
	GMB	0-6	grab	71BSGMBXAX01XA	BGMBAA						X					
			comp	71BSGMBXAX01XA	BGMBAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMBXBX01XA	BGMBBA						#					
			comp	71BSGMBXBX01XA	BGMBBA		O		O			#	#	#	#	#
	GMC	0-6	grab	71BSGMCXAX01XA	BGMCAA						X					
			comp	71BSGMCXAX01XA	BGMCAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMCXBX01XA	BGMCBA						#					
			comp	71BSGMCXBX01XA	BGMCBA		O		O			#	#	#	#	#
	GMD	0-6	grab	71BSGMDXAX01XA	BGMDAA						X					
			comp	71BSGMDXAX01XA	BGMDAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMDXBX01XA	BGMDBA						#					
			comp	71BSGMDXBX01XA	BGMDBA		O		O			#	#	#	#	#
	GME	0-6	grab	71BSGMEXAX01XA	BGMEAA						X					
			comp	71BSGMEXAX01XA	BGMEAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMEXBX01XA	BGMEBA						#					
			comp	71BSGMEXBX01XA	BGMEBA		O		O			#	#	#	#	#
	GMF	0-6	grab	71BSGMFXAX01XA	BGMFAA						X					
			comp	71BSGMFXAX01XA	BGMFAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMFXBX01XA	BGMFBA						#					
			comp	71BSGMFXBX01XA	BGMFBA		O		O			#	#	#	#	#

X = to be collected and submitted to laboratory

O = to be collected and submitted when the results form the 0-6" sample are received

= to be collected and submitted only if detected in the 0-6" sample

Table A.13-3, continued

MMR Soil Samples from Hand Auger Grids						Parameters:	Explosives (colorimetric)	Explosives (EPA 8330)	Inorganics	Target Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
Area	Grid	Depth	Type	MMR ID	EPA/Ogden ID	Cont:	8oz	8oz	8oz		4 oz.	8 oz.			4 oz.*	
17 (GP7) cont.	GMG	0-6	grab	71BSGMGXAX01XA	BGMGAA						X					
			comp	71BSGMGXAX01XA	BGMGAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMGXBX01XA	BGMGBA						#					
			comp	71BSGMGXBX01XA	BGMGBA		O		O			#	#	#	#	#
	GMH	0-6	grab	71BSGMHXAX01XA	BGMHAA						X					
			comp	71BSGMHXAX01XA	BGMHAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMHXBX01XA	BGMHBA						#					
			comp	71BSGMHXBX01XA	BGMHBA		O		O			#	#	#	#	#
	GMI	0-6	grab	71BSGMIXAX01XA	BGMIAA						X					
			comp	71BSGMIXAX01XA	BGMIAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMIXBX01XA	BGMIBA						#					
			comp	71BSGMIXBX01XA	BGMIBA		O		O			#	#	#	#	#
	GMJ	0-6	grab	71BSGMJXAX01XA	BGMJAA						X					
			comp	71BSGMJXAX01XA	BGMJAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMJXBX01XA	BGMJBA						#					
			comp	71BSGMJXBX01XA	BGMJBA		O		O			#	#	#	#	#
	GMK	0-6	grab	71BSGMKXAX01XA	BGMKAA						X					
			comp	71BSGMKXAX01XA	BGMKAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMKXBX01XA	BGMKBA						#					
			comp	71BSGMKXBX01XA	BGMKBA		O		O			#	#	#	#	#
	GML	0-6	grab	71BSGMLXAX01XA	BGMLAA						X					
			comp	71BSGMLXAX01XA	BGMLAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMLXBX01XA	BGMLBA						#					
			comp	71BSGMLXBX01XA	BGMLBA		O		O			#	#	#	#	#
	GMM	0-6	grab	71BSGMMXAX01XA	BGMMAA						X					
			comp	71BSGMMXAX01XA	BGMMAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMMXBX01XA	BGMMBA						#					
			comp	71BSGMMXBX01XA	BGMMBA		O		O			#	#	#	#	#
	GMN	0-6	grab	71BSGMNXAX01XA	BGMNAA						X					
			comp	71BSGMNXAX01XA	BGMNAA		X		X			X	X	X	X	X
		18-24	grab	71BSGMNXBX01XA	BGMNBA						#					
			comp	71BSGMNXBX01XA	BGMNBA		O		O			#	#	#	#	#

X = to be collected and submitted to laboratory

O = to be collected and submitted when the results form the 0-6" sample are received

= to be collected and submitted only if detected in the 0-6" sample

Table A.13-3, continued

MMR Soil Samples from Hand Auger Grids						Parameters:	Explosives (colorimetric)	Explosives (EPA 8330)	Inorganics	Target Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
Area	Grid	Depth	Type	MMR ID	EPA/Ogden ID	Cont:	8oz	8oz	8oz		4 oz.	8 oz.			4 oz.*	
16 (GP16)	GHA	0-6	grab	71BSGHAXAX01XA	BGHAAA						X					
			comp	71BSGHAXAX01XA	BGHAAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHAXBX01XA	BGHABA						#					
			comp	71BSGHAXBX01XA	BGHABA		O		O			#	#	#	#	#
	GHB	0-6	grab	71BSGHBXAX01XA	BGHBAA						X					
			comp	71BSGHBXAX01XA	BGHBAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHBXBX01XA	BGHBBA						#					
			comp	71BSGHBXBX01XA	BGHBBA		O		O			#	#	#	#	#
	GHC	0-6	grab	71BSGHCXAX01XA	BGHCAA						X					
			comp	71BSGHCXAX01XA	BGHCAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHCXBX01XA	BGHCBA						#					
			comp	71BSGHCXBX01XA	BGHCBA		O		O			#	#	#	#	#
	GHD	0-6	grab	71BSGHDXAX01XA	BGHDAA						X					
			comp	71BSGHDXAX01XA	BGHDAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHDXBX01XA	BGHDBA						#					
			comp	71BSGHDXBX01XA	BGHDBA		O		O			#	#	#	#	#
	GHE	0-6	grab	71BSGHEXAX01XA	BGHEAA						X					
			comp	71BSGHEXAX01XA	BGHEAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHEXBX01XA	BGHEBA						#					
			comp	71BSGHEXBX01XA	BGHEBA		O		O			#	#	#	#	#
	GHF	0-6	grab	71BSGHFXAX01XA	BGHFAA						X					
			comp	71BSGHFXAX01XA	BGHFAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHFXBX01XA	BGHFBA						#					
			comp	71BSGHFXBX01XA	BGHFBA		O		O			#	#	#	#	#
	GHG	0-6	grab	71BSGHGXAX01XA	BGHGAA						X					
			comp	71BSGHGXAX01XA	BGHGAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHGXBX01XA	BGHGBA						#					
			comp	71BSGHGXBX01XA	BGHGBA		O		O			#	#	#	#	#
	GHH	0-6	grab	71BSGHHXAX01XA	BGHHAA						X					
			comp	71BSGHHXAX01XA	BGHHAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHHXBX01XA	BGHHBA						#					
			comp	71BSGHHXBX01XA	BGHHBA		O		O			#	#	#	#	#

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Table A.13-3, continued

MMR Soil Samples from Hand Auger Grids						Parameters:	Explosives (colorimetric)	Explosives (EPA 8330)	Inorganics	Target Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
Area	Grid	Depth	Type	MMR ID	EPA/Ogden ID	Cont:	8oz	8oz	8oz		4 oz.	8 oz.			4 oz.*	
16 (GP16) cont.	GHI	0-6	grab	71BSGHIXAX01XA	BGHIAA						X					
			comp	71BSGHIXAX01XA	BGHIAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHIXBX01XA	BGHIBA						#					
			comp	71BSGHIXBX01XA	BGHIBA		O		O			#	#	#	#	#
	GHJ	0-6	grab	71BSGHJXAX01XA	BGHJAA						X					
			comp	71BSGHJXAX01XA	BGHJAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHJXBX01XA	BGHJBA						#					
			comp	71BSGHJXBX01XA	BGHJBA		O		O			#	#	#	#	#
	GHK	0-6	grab	71BSGHKXAX01XA	BGHKAA						X					
			comp	71BSGHKXAX01XA	BGHKAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHKXBX01XA	BGHKBA						#					
			comp	71BSGHKXBX01XA	BGHKBA		O		O			#	#	#	#	#
	GHL	0-6	grab	71BSGHLXAX01XA	BGHLAA						X					
			comp	71BSGHLXAX01XA	BGHLAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHLXBX01XA	BGHLBA						#					
			comp	71BSGHLXBX01XA	BGHLBA		O		O			#	#	#	#	#
	GHM	0-6	grab	71BSGHMXAX01XA	BGHMAA						X					
			comp	71BSGHMXAX01XA	BGHMAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHMXBX01XA	BGHMBA						#					
			comp	71BSGHMXBX01XA	BGHMBA		O		O			#	#	#	#	#
	GHN	0-6	grab	71BSGHNXAX01XA	BGHNAA						X					
			comp	71BSGHNXAX01XA	BGHNAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHNXBX01XA	BGHNBA						#					
			comp	71BSGHNXBX01XA	BGHNBA		O		O			#	#	#	#	#
	GHO	0-6	grab	71BSGHOXAX01XA	BGHOAA						X					
			comp	71BSGHOXAX01XA	BGHOAA		X		X			X	X	X	X	X
		18-24	grab	71BSGHOXBX01XA	BGHOBA						#					
			comp	71BSGHOXBX01XA	BGHOBA		O		O			#	#	#	#	#

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Table A.13-3, continued

MMR Soil Samples from Hand Auger Grids						Parameters:	Explosives (colorimetric)	Explosives (EPA 8330)	Inorganics	Target Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
Area	Grid	Depth	Type	MMR ID	EPA/Ogden ID	Cont:	8oz	8oz	8oz		4 oz.	8 oz.			4 oz.*	
20 (MP6)	M6A	0-6	grab	71BSM6AXAX01XA	BM6AAA						X					
			comp	71BSM6AXAX01XA	BM6AAA		X		X			X	X	X	X	X
		18-24	grab	71BSM6AXBX01XA	BM6ABA						#					
			comp	71BSM6AXBX01XA	BM6ABA		O		O			#	#	#	#	#
	M6B	0-6	grab	71BSM6BXAX01XA	BM6BAA						X					
			comp	71BSM6BXAX01XA	BM6BAA		X		X			X	X	X	X	X
		18-24	grab	71BSM6BXBX01XA	BM6BBA						#					
			comp	71BSM6BXBX01XA	BM6BBA		O		O			#	#	#	#	#
	M6C	0-6	grab	71BSM6CXAX01XA	BM6CAA						X					
			comp	71BSM6CXAX01XA	BM6CAA		X		X			X	X	X	X	X
		18-24	grab	71BSM6CXBX01XA	BM6CBA						#					
			comp	71BSM6CXBX01XA	BM6CBA		O		O			#	#	#	#	#
21 (MP5)	M5A	0-6	grab	71BSM5AXAX01XA	BM5AAA						X					
			comp	71BSM5AXAX01XA	BM5AAA		X		X			X	X	X	X	X
		18-24	grab	71BSM5AXBX01XA	BM5ABA						#					
			comp	71BSM5AXBX01XA	BM5ABA		O		O			#	#	#	#	#
	M5B	0-6	grab	71BSM5BXAX01XA	BM5BAA						X					
			comp	71BSM5BXAX01XA	BM5BAA		X		X			X	X	X	X	X
		18-24	grab	71BSM5BXBX01XA	BM5BBA						#					
			comp	71BSM5BXBX01XA	BM5BBA		O		O			#	#	#	#	#
	M5C	0-6	grab	71BSM5CXAX01XA	BM5CAA						X					
			comp	71BSM5CXAX01XA	BM5CAA		X		X			X	X	X	X	X
		18-24	grab	71BSM5CXBX01XA	BM5CBA						#					
			comp	71BSM5CXBX01XA	BM5CBA		O		O			#	#	#	#	#
	M5D	0-6	grab	71BSM5DXAX01XA	BM5DAA						X					
			comp	71BSM5DXAX01XA	BM5DAA		X		X			X	X	X	X	X
		18-24	grab	71BSM5DXBX01XA	BM5DBA						#					
			comp	71BSM5DXBX01XA	BM5DBA		O		O			#	#	#	#	#
	M5E	0-6	grab	71BSM5EXAX01XA	BM5EAA						X					
			comp	71BSM5EXAX01XA	BM5EAA		X		X			X	X	X	X	X
		18-24	grab	71BSM5EXBX01XA	BM5EBA						#					
			comp	71BSM5EXBX01XA	BM5EBA		O		O			#	#	#	#	#

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Table A.13-3, continued

MMR Soil Samples from Hand Auger Grids						Parameters:	Explosives (colorimetric)	Explosives (EPA 8330)	Inorganics	Target Analytes:	VOC	SVOC	PCB/Pest.	Herbicide	EDB	MTBE
Area	Grid	Depth	Type	MMR ID	EPA/Ogden ID	Cont:	8oz	8oz	8oz		4 oz.	8 oz.			4 oz.*	
19 (MP8)	M8A	0-6	grab	71BSM8AXAX01XA	BM8AAA						X					
			comp	71BSM8AXAX01XA	BM8AAA		X		X			X	X	X	X	X
		18-24	grab	71BSM8AXBX01XA	BM8ABA						#					
			comp	71BSM8AXBX01XA	BM8ABA		O		O			#	#	#	#	#
	M8B	0-6	grab	71BSM8BXAX01XA	BM8BAA						X					
			comp	71BSM8BXAX01XA	BM8BAA		X		X			X	X	X	X	X
		18-24	grab	71BSM8BXBX01XA	BM8BBA						#					
			comp	71BSM8BXBX01XA	BM8BBA		O		O			#	#	#	#	#
	M8C	0-6	grab	71BSM8CXAX01XA	BM8CAA						X					
			comp	71BSM8CXAX01XA	BM8CAA		X		X			X	X	X	X	X
		18-24	grab	71BSM8CXBX01XA	BM8CBA						#					
			comp	71BSM8CXBX01XA	BM8CBA		O		O			#	#	#	#	#
22 (control: OP5,6,7	OPA	0-6	grab	71BSOPAXAX01XA	BOPAAA						X					
			comp	71BSOPAXAX01XA	BOPAAA		X		X			X	X	X	X	X
		18-24	grab	71BSOPAXBX01XA	BOPABA						#					
			comp	71BSOPAXBX01XA	BOPABA		O		O			#	#	#	#	#
	OPB	0-6	grab	71BSOPBXAX01XA	BOPBAA						X					
			comp	71BSOPBXAX01XA	BOPBAA		X		X			X	X	X	X	X
		18-24	grab	71BSOPBXBX01XA	BOPBBA						#					
			comp	71BSOPBXBX01XA	BOPBBA		O		O			#	#	#	#	#
	OPC	0-6	grab	71BSOPCXAX01XA	BOPCAA						X					
			comp	71BSOPCXAX01XA	BOPCAA		X		X			X	X	X	X	X
		18-24	grab	71BSOPCXBX01XA	BOPCBA						#					
			comp	71BSOPCXBX01XA	BOPCBA		O		O			#	#	#	#	#
	OPD	0-6	grab	71BSOPDXAX01XA	BOPDAA						X					
			comp	71BSOPDXAX01XA	BOPDAA		X		X			X	X	X	X	X
		18-24	grab	71BSOPDXBX01XA	BOPDBA						#					
			comp	71BSOPDXBX01XA	BOPDBA		O		O			#	#	#	#	#
	OPE	0-6	grab	71BSOPEXAX01XA	BOPEAA						X					
			comp	71BSOPEXAX01XA	BOPEAA		X		X			X	X	X	X	X
		18-24	grab	71BSOPEXBX01XA	BOPEBA						#					
			comp	71BSOPEXBX01XA	BOPEBA		O		O			#	#	#	#	#

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Photograph A: Looking southeast across Gun Position 16.

Photograph B: Looking east across Gun Position 16.

Photograph C: Looking northeast across Gun Position 18.

Photograph D: Looking southeast across Gun Position 18.

Photograph E: Looking east across Mortar Position 5.

Photograph F: Looking east across Mortar Position 6.

Photograph G: Looking northeast across Mortar Position 8.

Photograph H: Looking northwest across Gun Position 7.

Photograph I: Looking northeast across Gun Position 7.

Photograph J: Looking north across Observation Position 5.

Photograph K: Looking north toward Observation Position 6.

Photograph L: Looking east across Observation Position 6.

Photograph M: Looking northeast toward Observation Position 7.

Photograph N: Looking northeast across Observation Position 7.

ATTACHMENT A: FIELD GUIDE TO HIGH EXPLOSIVES

Any substance encountered during sampling activities which differs in any way from natural media will be treated as a dangerous substance, carefully removed from the sample, and set aside.

EXPLOSIVES

NAME	DESCRIPTION	REMARKS
BLACK POWDER	BROWN TO BLACK	MANUFACTURED IN GRAINS THAT RANGE IN SIZE FROM SMALLER THAN SALT GRAINS TO GRAINS AS LARGE AS SMALL PEBBLES. HIGHLY SENSITIVE TO IGNITION BY HEAT, FRICTION, FLAME, SPARK. WHEN WET, IT IS CORROSIVE TO MOST METALS.
TNT	LIGHT YELLOW TO BROWN OR GRAY	LIGHTLY CORROSIVE WITH LEAD. USED IN BOMBS, GRENADES, DEMOLITION CHARGES, PROJECTILES. EXUDES AT ELEVATED TEMPERATURES. MODERATELY TOXIC BY SKIN ABSORPTION OR INHALATION.
EXPLOSIVE D	BRIGHT YELLOW TO ORANGE. ALSO CALLED AMMONIUM PICRATE.	RELATIVELY INSENSITIVE. HIGHLY TOXIC BY INHALATION, INGESTION, OR SKIN ABSORPTION
AMATOL	LIGHT BROWN TO YELLOW/MIXTURE OF TNT AND EXPLOSIVE D	SLIGHT HYGROSCOPIC. HAS CORROSIVE EFFECTS ON COPPER, BRONZE, LEAD, BRASS. HIGHLY TOXIC BY INHALATION, SKIN CONTACT, INGESTION.
COMPOSITION B	WHITE TO BROWNISH YELLOW, MIXTURE OF TNT AND EXPLOSIVE D	SLIGHTLY CORRODES COPPER, BRASS, CADMIUM, ZINC. USED IN BOMBS, PROJECTILES, GRENADES, SHAPED CHARGES.
OCTOL	LIGHT BROWN	USED IN BOMBS, PROJECTILES, SHAPED CHARGES.
RDX	WHITE. ALSO CALLED CYCLONITE	SENSITIVE TO IMPACT AND FRICTION.SLIGHTLY CORROSIVE WITH COPPER, BRASS, MILD STEEL, CADMIUM. MODERATELY TOXIC BY INHALATION OR INGESTION.
HMX	WHITE. ALSO CALLED OCTOGEN	SENSITIVE TO IMPACT AND FRICTION. SLIGHTLY TOXIC.
PETN	WHITE	SENSITIVE TO IMPACT. SLIGHTLY CORROSIVE TO BRASS, CADMIUM, ZINC. VERY SLIGHTLY TOXIC.

EXPLOSIVES, continued

NAME	DESCRIPTION	REMARKS
LEAD AZIDE	WHITE TO LIGHT BROWN	VERY SENSITIVE TO IMPACT, FRICTION, SPARKS. CORROSIVE TO COPPER, ZINC. VERY SLIGHTLY TOXIC.
LEAD STYPHNATE	LIGHT ORANGE TO REDDISH BROWN	SAME AS LEAD AZIDE.
MERCURY FULMINATE	GRAYISH	VERY SENSITIVE TO IMPACT, FRICTION, SPARKS. CORROSIVE TO ALUMINUM, MAGNESIUM, BRONZE, COPPER, ZINC, BRASS. HIGHLY TOXIC THROUGH SKIN ABSORPTION, INHALATION, INGESTION. SYMPTOMS RESEMBLE MERCURY POISONING.

PYROTECHNIC AGENTS USED AT MMR

SYMBOL	COMMON NAME	VISUAL IDENTIFICATION	ACTION
CS	NONE	WHITE CRYSTALLINE SOLID	TEAR AGENT
HC	HEXACHORO-ETHANE	WHITE SOLID	SCREENING SMOKE
WP	WHITE PHOSPHOROUS	PALE YELLOW SOLID	SCREEN SMOKE AND INCENDIARY
RP	RED PHOSPHOROUS	REDDISH BROWN POWDER	SCREENING SMOKE

OTHER COMPOUNDS

NAME	PROPERTIES	STABILITY
Picric Acid	lemon-yellow crystalline solid	very sensitive to blows or friction
Tetryl	fine yellow crystalline powder	sensitive to blows or friction
Composition A	unknown	unknown
Composition C3	unknown	unknown
Composition C4	unknown	unknown
Pentolite (50/50)	unknown	unknown
Tracer Compound	unknown	unknown
PBX	unknown	unknown
Ednatol	unknown	unknown
Tetrytol	unknown	unknown

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